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FINAL REPORT

NOBLOCH MINE PROJECT
ROSEBUD COUNTY, MONTANA
MT A/E 86-46-116

JULY, 1987

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FINAL REPORT

NOBLOCH MINE PROJECT
ROSEBUD COUNTY, MONTANA
MT A/E 86-46-116

JULY, 1987

Prepared for: MR. RICHARD JUNTUNEN, CHIEF
Abandoned Mine Reclamation
Bureau
Department of State Lands
1625 11th Avenue
Helena, MT 59620

Prepared by: L.C. HANSON COMPANY
Consulting Engineers
3108 McHugh Lane
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Helena, MT 59624

THOMAS D. KLEMPER, E-I-T
Project Engineer

EDWARD L. LARSON, E-I-T
Project Inspector

L. C. HANSON COMPANY
CONSULTING ENGINEERS & SURVEYORS
HELENA — GREAT FALLS — GLENDIVE

KNOBLOCH MINE PROJECT

INTRODUCTION

Project Objectives

The objectives of this project were to fill mine voids under a driveway, dispose of a coal waste pile, and close one adit. Disturbed areas were revegetated by seeding native grasses.

History

The mine was operated from the mid 1910's to the late 1940's. The mine operated intermittently for 30 years. The coal was used to satisfy local domestic demand.

Project Location

The KNOBLOCH reclamation project is located in Section 18, T5S, R58E in Rosebud County, Montana. The site is approximately 21 miles southeast of Ashland, Montana.

Site Description and Problems

The land surrounding the mine is native grassland and irrigated

hayland along the Tongue River. The overburden is clay and sandy gravel with a 2-foot layer of shale immediately above the coal. The mine is a single-entry mine which branches to form two drifts extending 250 feet into a 40-foot high bluff along the east bank of the Tongue River.

The mine operators left the area impacted with a slack pile and open adit. In the late 1970's the lessee moved a trailer home near the mine and installed permanent sewer and electric power lines. Drilling and underground monitoring revealed that the trailer was not undermined, but the driveway in front of the residence was located over the mine voids.

DESCRIPTION OF RECLAMATION PROJECT

Project Planning

The planning for this project was completed by an evaluation of several methods of reclamation ranging from closing the adit only to excavation of the entire mine workings. The most economical method with the reduction of the hazards was to pneumatically stow the areas under the driveway and close the adit. Planning was aided by preliminary drilling, underground monitoring, site visits and landowner interviews.

Chronological History

A pre-bid meeting was held on September 9, 1986 for all interested

bidders and parties. On September 25 bids were opened for the reclamation project. BARSTAD'S INC. of Williston, North Dakota was awarded the general Contract on October 14. The Agreement was made on October 20 with a pre-construction meeting and Notice to Proceed issued on November 3, 1986.

The Contractor demonstrated his directional stowing equipment at his material source. After a favorable demonstration, the Contractor began drilling the boreholes and stockpiling stowing material at the site. The Contractor was able to drill for 2 days until weather conditions prompted a Winter Shut Down on November 6.

Work was resumed on April 20, 1987. The work progressed smoothly until May 6 when all work was completed. Areas which required seeding and fertilizing were completed prior to the May 1 deadline.

Equipment

The following equipment was used during the course of the work.

Cable drill rig on Ford 6000 Truck
Ford A-62 Front-end Loader
Ford F-7000 Truck w/Leroi air compressor
Kolman conveyor belt, hopper and screen
Massey Ferguson 220-4 Tractor w/loader and 6' blade
Ford Super Duty 850 Truck w/12 C.Y. dump box
Mor-Tech-Fab 500 gallon fiberglass water tank w/Monarch SBSGF-8 pump
Flatbed trailer w/welder and tools

Ford F250 XLT Pickup

Dutton Air Compressor on 2-axle trailer

1/4 C.Y. tractor mounted concrete mixer

Construction Operations

The Contractor performed the work in the following order with the indicated equipment. Some operations were concurrent.

Screened material with Kolman screen.

Drilled boreholes with cable rig.

Stockpiled stowing material with dump truck.

Stowed material using the loader, conveyor, drill rig, air compressors and directional stowing nozzle.

Closed mine opening and disposed of coal slack into mine opening with front-end loader.

Topsoiled disturbed areas.

Spread fertilizer and seed with hand-held broadcasters.

Grouted remaining voids and boreholes with 8 C.Y. rented mixer truck and 1/4 C.Y. tractor-mounted mixer.

Placed scoria on driveway with dump truck and front-end loader.

COST SUMMARY

Final Payment Request and Reconciliation Change Order

A copy of the Final Payment Request and Reconciliation Change Order are contained in Appendix A. These documents contain the final

quantities and costs for each pay item.

Change Orders

No change orders were issued other than the Reconciliation Change Order.

Cost per Site or Unit

Table I shows the cost summary for the KNOBLOCH reclamation project. Related items have been combined in Table I. Incidentals include Mobilization and Debris Cleanup. Underground Reclamation includes Borehole Drilling, Borehole Reaming, Underground Mine Stowing, Water Injection and Grout Injection. Revegetation includes Fertilizer and Seed.

TABLE I

COST SUMMARY

| ITEM | UNITS | TOTAL COST | COST/UNIT |
|-------------------|---------|------------|-------------|
| Incidentals | Site | \$5650 | \$5650/Site |
| Salvage & Replace | | | |
| Topsoil | 50 C.Y. | \$500 | \$10/C.Y. |

| | | | |
|---------------------|------------|-------------|--------------------|
| Close Adit | 1 Each | \$1000 | \$1000/Adit |
| Waste Pile Disposal | 0.2 Acre | \$800 | \$4000/Acre |
| Provide Water | 2 MGal | \$40 | \$20/MGal |
| Underground | | | |
| Reclamation | 0.10 Acre | \$17,487 | \$175,000/ Acre |
| Backfill Borehole | | | |
| Into Mine Void | 2 Each | \$300 | \$150/Each |
| Revegetation* | 0.17 Acres | \$456.40 | \$2685/Acre |
| Resurface Driveway | 80 C.Y. | \$1600 | \$20/C.Y. |
| TOTAL | 0.3 ACRES | \$27,833.40 | \$93,000/ ACRE |

* Vegetative Mulch was deleted

SUMMARY

Completed Reclamation

The project was completed at a cost 31% over the bid price and used 85% of the Contract time. The overrun was due to an 85% increase in

the amount of stowing required to complete the reclamation. Contract time was extended by five (5) days to accommodate the increase in work. The project was completed to the satisfaction of the Contractor, Landowner and Engineer.

The Landowner requested that vegetative mulch be deleted from the Contract. The reason for this request was to minimize the amount and varieties of weeds introduced on the disturbed areas. The Montana Department of State Lands agreed with the Landowner and no mulch was applied.

Comments

The Winter Shut Down for this project resulted in the only poor condition of the project. The borehole covers did not provide for a long-term shutdown and were in poor condition when work resumed in the Spring.

The work was completed within the Contract time allowed, however, the Contractor worked many 12 to 14 hour days. The Contractor was continually changing workers on the site resulting in an orientation period every week or two weeks. Some experimentation was required to keep the machinery stowing at a profitable rate. Coordination between the Contractor and Inspector allowed the placement of the stowing nozzle near the roof of the mine and allowed the Contractor to change stowing directions before the material blocked other stowing directions.

Grout injection operations ruptured the stowed cut off walls resulting in some grout being placed outside the designated areas. This was minimized by placing the grout in small quantities in each borehole in a rotating order resulting in a much more accurate placement of the material.

The Contractor demonstrated a directional stowing system which operated very well. The stowing nozzle required repair after 200 C.Y. of material were placed. No other components showed significant wear.

SLIDES

Photographic records of the exploratory drilling, pre-construction conditions, construction activities and final product are contained in Appendix B. The slides are presented with Slide Logs.

APPENDIX A

Payment Request No. 8

RECEIVED

From: April 17, 1987

To: May 13, 1987

JUN 15 1987

Project Name: Knobloch Mine Project

LOWELL C. HANSON CO.

Location: Rosebud Co. Mt.

Project No.: Mont A/E 86-46-116

Name Of Contractor: Barstad's Inc.

Address: 710 W 15th St. Williston,
ND 58801

Summary Of Project Status

| | |
|--------------------------------------|-------------|
| Amount of Original Contract | \$21,173.00 |
| Amount of Approved Change Order(s) | 6,660.40 |
| TOTAL CONTRACT AMOUNT | 27,833.40 |
| Contract Time Used to Date | 22 Days |
| Percentage of Contract Time Used | 85% |
| Percentage of Contract Amount Earned | 100% |

| | |
|------------------------------------|--------------|
| Original Contract Amount Completed | 21,173.00 |
| Change Order(s) Amount Completed | 6,660.40 |
| Amount for Materials On Site | 0.00 |
| TOTAL To Date | 27,833.40 |
| Times 90% = | No Retainage |
| TOTAL AMOUNT Earned To Date | 27,833.40 |
| Less Previous Amount Earned | 5,015.52 |
| Amount Payable This Period | 22,817.88 |
| Less 1% Gross Receipts Tax | 228.18 |
| TOTAL DUE CONTRACTOR THIS PERIOD | \$22,589.70 |

Requested By: Barstad's Inc.

(Contractor)

Date: June 8, 87

Checked By: L.C. Hanson Co.

(Engineer)

Date: 6/12/87

Approved By: Department of State Lands
Abandoned Mine Reclamation Bureau

(Owner)

Date: 6/12/87

L.C. Hanson Co.

MCNT A/E 86-46-116

ITEMIZATION OF QUANTITIES AND COSTS

1 Work completed on this item

L.C. Hanson Co.

Page 3 of 3

| ITEM NO. | DESCRIPTION | ESTIMATED PLAN QUANTITY | UNIT BID PRICE | UNITS OF WORK COMPLETED THIS REQUEST | UNITS OF WORK COMPLETED TO DATE | TOTAL COST OF COMPLETED WORK | % OF EST. QUANT. COMP. |
|----------|------------------|-------------------------|----------------|--------------------------------------|---------------------------------|------------------------------|------------------------|
| 14 | Provide Water | 6.0 MGal | 20.00 | 2.00 | 2.00 | 40.00 | 100% |
| 15 | Fertilizer | 18.5 lb. | 20.00 | 15.20 | 15.20 | 304.00 | 100% |
| 16 | Seed | 9.4 lb. | 20.00 | 7.62 | 7.62 | 152.40 | 100% |
| 17 | Vegetative Mulch | 600.0 lb. | 3.00 | 0.00 | 0.00 | 0.00 | 100% |
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| | Sub-Total | | | | | 496.40 | |
| | Total | | | | | 27833.40 | |

* Work completed on this item

2.12 CHANGE ORDER

Order No. 1Date: June 1, 1987Agreement Date: October 20, 1986NAME OF PROJECT: NOBLOCH MINE PROJECT**RECEIVED**MT A/E 86-46-116OWNER: Montana Dept. of State LandsJUN 15 1987CONTRACTOR: Barstad's, Inc.LOWELL C. HANSON CO.

Change Orders must be accompanied by an itemized cost breakdown. You are hereby requested to comply with the following changes from the Contract Documents. (Show separate costs for materials, labor, equipment and miscellaneous. Show percent where applicable.)

| ITEM NO. | DESCRIPTION OF CHANGES - ESTIMATED QUANTITIES & UNITS | COST OF CHANGES | | | | | TOTAL COST |
|---|--|-----------------|-------|--------|---------------|-----------------|------------|
| | | MAT'LS | LABOR | EQUIP. | MISC. | TOTAL UNIT COST | |
| | RECONCILIATION OF FINAL QUANTITIES (SEE ATTACHED SHEET) | | | | | | |
| TOTAL COST - MAT'LS, LABOR, EQUIPMENT & MISC. | | | | | + \$ 6,650.40 | | |
| OVERHEAD & PROFIT @ <u>-0-</u> % | | | | | --- | | |
| GRAND TOTAL - THIS CHANGE ORDER | | | | | 6,660.40 | | |

| | |
|--|--------------------|
| Original Contract Price | <u>\$21,173.00</u> |
| Current Contract Price Adjusted by Previous Change Order | <u>21,173.00</u> |
| Cost This Change Order (+ or -) | <u>+ 6,650.40</u> |
| New Contract Price Including This Change Order | <u>\$27,833.40</u> |

The completion date as set forth in the Contract Documents shall be (Unchanged, increased, ~~decreased~~) by Five (5) calendar days.

The date for completion of all work will be May 13, 1987.

Description and Justification for Change:

1. Work was increased due to larger underground rooms than estimated and more of the existing driveway needed resurfaced. Work reductions were due to a smaller actual disturbed area and area moisture conditions. Two items were not performed. Casing pipe was not required and vegetative mulch was deleted from the project on the Landowner's request.

RECEIVED

JUN 12 1987

LOWELL C. HANSON CO.

SURETY CONSENT

The surety hereby consents to the aforementioned Contract Change Order and agrees that its bond or bonds shall apply and extend to the Contract as thereby modified or amended per this Change Order. The principal and the Surety further agree that on or after execution of this consent, the penalty of the applicable Performance Bond or Bonds is hereby increased by

(\$ 6650.40) (One hundred percent (100%) of the Change Order amount) and the penalty of the applicable Payment Bond or Bonds is hereby increased by _____ (\$ _____)

(One hundred percent (100%) of the Change Order amount).

COUNTERSIGNED BY MONTANA RESIDENT AGENT

SURETY

American State Bank & Trust Co. of Williston, N. Dak.

BY: _____

(Seal)

Recommended by: L. C. Hanson Company Allan W. Type, Engineer 6/3/87 Date

Accepted by: [Signature], Contractor 6/8/87

Approved by: Susan McAnally - DSL, Owner 6/12/87

Change Order No. 1
KNOBLOCH MINE PROJECT
MT A/E 86-46-116
June 1, 1987

RECONCILIATION OF QUANTITIES

| ITEM NO. | DESCRIPTION | ESTIMATED QUANTITY | ACTUAL QUANTITY | CHANGE IN PRICE |
|---------------------------|--------------------------|-----------------------|--------------------|--------------------|
| 2. | BOREHOLE DRILL - 4-3/4" | 170 L.F. | 194 L.F. | +\$ 12.00 |
| 3. | BOREHOLE REAMING - 10" | 270 L.F. | 292 L.F. | + 330.00 |
| 4. | CASING PIPE - 8" I.D. | 220 L.F. | -0- | - 110.00 |
| 5. | UNDERGROUND MINE STOWING | 200 C.Y. | 370 C.Y. | + 2,040.00 |
| 6. | WATER INJECTION | 1.0 MGAL | 4.0 MGAL | + 60.00 |
| 7. | GROUT INJECTION | 25 C.Y. | 70.75 C.Y. | + 5,490.00 |
| 9. | RESURFACE DRIVEWAY | 40 C.Y. | 80 C.Y. | + 800.00 |
| 14. | PROVIDE WATER | 6.0 MGAL | 2.0 MGAL | - 80.00 |
| 15. | FERTILIZER | 18.5 LBS. | 15.2 LBS. | - 66.00 |
| 16. | SEED | 8.4 LBS. | 7.62 LBS. | - 15.60 |
| 17. | VEGETATIVE MULCH | 600 LBS. | -0- | - 1,800.00 |
| TOTAL - THIS CHANGE ORDER | | | | +\$ 6,660.40 |

APPENDIX B

SLIDE LOG

KNOBLOCH MINE PROJECT

| | | | |
|----|---------|---------|--------------------------------------|
| 1 | 9/19/85 | At Site | Slack pile near adit |
| 2 | 9/19/85 | At Site | Fjell residence |
| 3 | 9/19/85 | At Site | Exploratory drilling |
| 4 | 9/19/85 | At Site | Exploratory drilling |
| 5 | 9/19/85 | At Site | Exploratory drilling |
| 6 | 11/3/86 | At Site | Driveway looking west before |
| 7 | 11/3/86 | At Site | Slackpile before |
| 8 | 11/3/86 | At Site | Trail to lower area |
| 9 | 11/3/86 | At Site | Borrow area before |
| 10 | 11/3/86 | At Site | Coal car |
| 11 | 11/3/86 | At Site | Slack and adit before |
| 12 | 11/3/86 | At Site | Slack pile before |
| 13 | 11/3/86 | At Site | Drive out before |
| 14 | 11/5/87 | At Site | Drill rig |
| 15 | 11/5/87 | At Pit | Loading at pit |
| 16 | 11/5/87 | At Pit | Loader |
| 17 | 11/5/87 | At Pit | Dump truck |
| 18 | 11/5/87 | At Pit | Demonstration |
| 19 | 11/5/87 | At Pit | Demonstration air compressor |
| 20 | 11/5/87 | At Pit | Demonstration gravel spray |
| 21 | 11/5/87 | At Pit | Demonstration gravel spray |
| 22 | 11/5/87 | At Pit | Demonstration compressors on trailer |
| 23 | 11/5/87 | At Site | Drill rig |

| | | | |
|----|----------|---------|--------------------------------------|
| 24 | 11/5/87 | At Site | Driveway partial |
| 25 | 11/6/87 | At Site | Driveway w/staked holes |
| 26 | 12/18/87 | At Site | Borehole |
| 27 | 12/18/87 | At Site | Stockpile |
| 28 | 12/18/87 | At Site | Broken hole cover |
| 29 | 12/18/87 | At Site | Driveway |
| 30 | 12/18/87 | At Site | Sign and drill piles |
| 31 | 12/18/87 | At Site | Driveway looking northeast |
| 32 | 12/18/87 | At Site | Cuttings pile |
| 33 | 12/18/87 | At Site | Driveway looking west |
| 34 | 12/18/87 | At Site | Coal slack |
| 35 | 12/18/87 | At Site | Coal slack |
| 36 | 12/18/87 | At Site | Fjell residence |
| 37 | 12/18/87 | At Site | Stockpile looking northeast |
| 38 | 12/18/87 | At Site | Driveway looking west w/stockpile |
| 39 | 12/18/87 | At Site | Driveway from stockpile |
| 40 | 12/18/87 | At Pit | Stower at pit |
| 41 | 12/18/87 | At Pit | Stower at pit |
| 42 | 4/20/87 | At Site | Tractor w/loader |
| 43 | 4/20/87 | At Site | Cable drill rig |
| 44 | 4/20/87 | At Site | Leroi on Ford truck |
| 45 | 4/20/87 | At Site | Kolman conveyor |
| 46 | 4/20/87 | At Site | Cable drill rig |
| 47 | 4/20/87 | At Site | Dump truck |
| 48 | 4/20/87 | At Site | TV camera |
| 49 | 4/21/87 | At Site | 500-gallon tank w/pump |
| 50 | 4/21/87 | At Site | Ford A-62 Loader |

| | | | |
|----|---------|---------|----------------------------|
| 51 | 4/21/87 | At Site | Machinery to stow |
| 52 | 4/21/87 | At Site | Ford 4x4 pickup |
| 53 | 4/21/87 | At Site | Driveway before stowing |
| 54 | 4/21/87 | At Site | Driveway |
| 55 | 4/21/87 | At Site | Site before stowing |
| 56 | 4/21/87 | At Site | Cutting stored off site |
| 57 | 4/21/87 | At Site | Boreholes #18 and #19 |
| 58 | 4/21/87 | At Site | Basketball hoop |
| 59 | 4/27/87 | At Site | Slack piled up |
| 60 | 4/27/87 | At Site | Stowing in Borehole #2 |
| 61 | 4/27/87 | At Site | Trees and adit |
| 62 | 4/27/87 | At Site | Kolman conveyor |
| 63 | 4/27/87 | At Site | Stowing stockpile |
| 64 | 4/27/87 | At Site | Adit |
| 65 | 4/27/87 | At Site | Driveway |
| 66 | 4/27/87 | At Site | Toward house |
| 67 | 4/27/87 | At Site | Toward gate |
| 68 | 4/27/87 | At Site | Driveway w/hole covers |
| 69 | 4/27/87 | At Site | Stowing stockpile |
| 70 | 4/27/87 | At Site | Tree and adit |
| 71 | 4/27/87 | At Site | TV camera |
| 72 | 4/27/87 | At Site | Site before extra stowing |
| 73 | 4/28/87 | At Site | Waste pile disposal during |
| 74 | 4/28/87 | At Site | Closing adit |
| 75 | 4/28/87 | At Site | Additional borrow area |
| 76 | 4/28/87 | At Site | Waste in adit |
| 77 | 4/29/87 | At Site | Closing adit |
| 78 | 4/29/87 | At Site | Closed adit |

| | | | |
|----|---------|---------|-------------------------|
| 79 | 4/29/87 | At Site | Waste pile area after |
| 80 | 4/29/87 | At Site | Adit after |
| 81 | 4/30/87 | At Site | Stowed piles and nozzle |
| 82 | 4/30/87 | At Site | Stowing |
| 83 | 4/30/87 | At Site | Stowing |
| 84 | 5/5/87 | At Site | Mixer truck |
| 85 | 5/5/87 | At Site | Loading mixer |
| 86 | 5/5/87 | At Site | Stand pipes |
| 87 | 5/5/87 | At Site | 1/4 C.Y. mixer |
| 88 | 5/5/87 | At Site | Driveway |
| 89 | 5/5/87 | At Site | Front steps |
| 90 | 5/16/87 | At Site | Driveway complete |
| 91 | 5/16/87 | At Site | Driveway complete |

APPENDIX C

ANALYSIS OF PROFESSIONAL SERVICE FEES
 DATE OF PREPARATION: August 10, 1987
 PROJECT: Knobloch

 PROFESSIONAL SERVICE AMOUNT

| | |
|--|-------------|
| * Data Gathering, Site Evaluation, Preliminary Engineering, Final Engineering, Bidding Documents | \$16,997.17 |
| * Construction Administration, Construction Inspection, Final Report Preparation | \$11,750.44 |

| | |
|-----------------------|-------------------------------|
| L.C. HANSON CO. COSTS | ----- \$28,747.61 ----- |
|-----------------------|-------------------------------|

| | |
|--------------------|-------------------------------|
| CONSTRUCTION COSTS | ----- \$27,833.40 ----- |
|--------------------|-------------------------------|

PERCENTAGE ANALYSIS

| | |
|---|---------|
| PRE-CONST. LCH CO COST/CONSTRUCTION COST | 61.07% |
| CONST. & POST CONST. LCH CO. COST/CONSTRUCTION COST | 42.22% |
| TOTAL LCH CO. COST/CONSTRUCTION COST | 103.28% |

REMARKS: Services provided include lien determination, landowner consent, budget preparation, grant application, weed board approval, basic engineering, construction staking, contract administration, quantity accounting and full time resident inspection. Preliminary drilling was required to evaluate and plan the project. This project involved a remote site and the construction took place during two construction seasons. Additional voids were found during construction requiring additional work necessary to complete the total reclamation. As a result a change order was necessitated for construction.
